

Notice of Allowability

Application No.

10/776,346

Examiner

Michael J. Early

Applicant(s)

SEIVER ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment after Non-Final Rejection (filed on 9/18/06).
2. ☒ The allowed claim(s) is/are 7, 8, 16 and 17.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 20061206.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

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EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Elwood Haynes on 12/6/06.

The application has been amended as follows:

Regarding Claim 7, the limitations have been amended and are recited as follows:

A system for optimizing the recovery of argon comprising: an air input subsystem configured to intake and process atmospheric air; at least one distillation column to receive a processed air stream from the air input and to output a raw argon stream, wherein the at least one distillation column is located downstream from the air input system; a crude argon column to receive and process the raw argon stream and to output a crude argon stream; and a controller to automatically control the composition of the raw argon stream so as to decrease a concentration of oxygen in the raw argon stream while preventing a concentration of nitrogen in the crude argon stream from exceeding a selected value, wherein the controller is a multivariable predictive controller that effects control of at least one constraint variable and to at least one manipulated variable, wherein the at least one constraint variable includes at least one of: ~~gas oxygen flow purity, raw argon flow purity, vented gas oxygen flow amount, low-pressure nitrogen purity,~~ liquid nitrogen reflux impurity, and raw argon stream midpoint purity, ~~amount of oxygen in the crude argon stream, and amount of nitrogen in the crude argon stream.~~

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Regarding Claim 8, the limitations have been amended and are recited as follows:

A system for optimizing the recovery of argon comprising: an air input subsystem configured to intake and process atmospheric air; at least one distillation column to receive a processed air stream from the air input and to output a raw argon stream, wherein the at least one distillation column is located downstream from the air input system; a crude argon column to receive and process the raw argon stream and to output a crude argon stream; and a controller to automatically control the composition of the raw argon stream so as to decrease a concentration of oxygen in the raw argon stream while preventing a concentration of nitrogen in the crude argon stream from exceeding a selected value, wherein the controller is a multivariable predictive controller that effects control of at least one constraint variable and to at least one manipulated variable, wherein the at least one manipulated variable includes at least one of: ~~gaseous oxygen flow amount out of the low-pressure column, liquid nitrogen reflux flow amount into the low-pressure column, liquid nitrogen assist flow amount into the low-pressure column, crude argon flow amount drawn from the crude argon column, and air flow amount from the air input subsystem.~~

Regarding Claim 16, the limitations have been amended and are recited as follows:

In a system including an air intake subsystem, at least one distillation column, a crude argon distillation column, and a controller; a process for optimizing the recovery of argon in a an air separation unit comprising the steps of: (a) directing a flow of atmospheric air into the air intake subsystem and processing the atmospheric air; (b) directing the processed air from the air intake subsystem into at least one distillation column to produce at least one raw argon stream; (c) directing the at least one raw argon stream from the at least one distillation column to a crude argon distillation column to process the raw argon stream and to output a crude argon stream; and (d) automatically controlling the composition

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of the raw argon stream via the controller so as to decrease a concentration of oxygen in the raw argon stream while preventing a concentration of nitrogen in the crude argon stream from exceeding a selected value, wherein the controller is a multivariable predictive controller that effects control of at least one constraint variable and at least one manipulated variable, wherein the at least one constraint variable includes at least one of: ~~gas oxygen flow purity, raw argon flow purity, amount of vented gas oxygen flow, low pressure nitrogen purity, liquid nitrogen reflux impurity, raw argon stream midpoint purity, amount of oxygen in the crude argon stream, and amount of nitrogen in the crude argon stream.~~

Regarding Claim 17, the limitations have been amended and are recited as follows:

In a system including an air intake subsystem, at least one distillation column, a crude argon distillation column, and a controller; a process for optimizing the recovery of argon in a an air separation unit comprising the steps of: (a) directing a flow of atmospheric air into the air intake subsystem and processing the atmospheric air; (b) directing the processed air from the air intake subsystem into at least one distillation column to produce at least one raw argon stream; (c) directing the at least one raw argon stream from the at least one distillation column to a crude argon distillation column to process the raw argon stream and to output a crude argon stream; and (d) automatically controlling the composition of the raw argon stream via the controller so as to decrease a concentration of oxygen in the raw argon stream while preventing a concentration of nitrogen in the crude argon stream from exceeding a selected value, wherein the controller is a multivariable predictive controller that effects control of at least one constraint variable and at least one manipulated variable, wherein the at least one manipulated variable includes at least one of: ~~amount gaseous oxygen flow out of the low pressure column, amount of liquid nitrogen reflux flow into the low-pressure column, amount of liquid nitrogen assist flow into the low-pressure~~

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~~column, amount of crude argon flow drawn from the crude argon column, and amount of air flow drawn into the air intake.~~

The following is an examiner's statement of reasons for allowance:

The prior art does anticipate nor render obvious the combination set forth in the independent claims, and specifically does not show the at least one constraint variable being liquid nitrogen reflux impurity or raw argon stream midpoint purity, or of the at least one manipulated variable being liquid nitrogen reflux flow amount into the low-pressure column. Al-Chalabi (US 4,784,677) and Seiver et al. (US 6,622,521 B2), the closest prior art, teach(es) most of the structural limitations, but is/are silent regarding the constraint variable being liquid nitrogen reflux impurity or raw argon stream midpoint purity, and the manipulated variable being liquid nitrogen reflux flow amount into the low-pressure column. Espie (US 6,006,546) teaches of an air separation unit that may have the liquid nitrogen reflux (33 – nitrogen enriched liquid) impurity (via FIC [207, 211]) as a constraint or manipulated variable (as seen in Figure 2); however, one of ordinary skill in the art would not have referred to this prior art because the respective system does not disclose the recovery of argon. One of ordinary skill in the art would not have rendered this element/these elements obvious without impermissible hindsight. Therefore, the claim(s) are patentable over the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael J. Early whose telephone number is (571) 272-3681. The examiner can normally be reached on Monday - Friday, 7am - 4:30pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler can be reached on (571) 272-4834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MJE
12/6/06

Michael J. Early
Patent Examiner
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SUPERVISORY PATENT EXAMINER